THE EMBODIMENT OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. an improved axial fan for exhausting humid, corrosive and dusty air, the improvements comprising:

a) a streamlined housing enclosure having an inner cavity defining an air flow passageway having large radii corners and having a first opening of square section with a shutter assembly consisting of a frame on which are pivotally mounted a plurality of vanes including a central vane, for closing or opening said first opening, each of said vanes being pivotally interconnected, with crank rods and at least one tie rod, said frame further comprising an operative extension spring with one end connected to said frame and the other end connected to said tie rod for urging, upon fan operation, the shutter vanes toward full wide open position,

b) an axially spaced second opening of round section including a safety guard,

c) a streamlined central structural member, axially spaced between said openings, connecting two opposite sides of said housing and comprising a pair of airfoil wings for guiding efficiently the air flow,

d) a drive motor either electric or hydraulic mounted on a rigid base secured to said central structural member,

e) a propeller- pulley assembly secured at one end of a rotating shaft fitted into a pair of pillow blocks bearings bolted to said central structural member in the middle thereof for rotatably holding said propeller-pulley assembly comprising a plurality of airfoil blades extending radially outwardly therefrom and rotating therewith, said propeller pulley assembly being located opposite to said shutter assembly,

f) a Venturi built with said streamlined fan housing enclosure, substantially entirely surrounding at close distance the tip blades of the propeller,

g) a centrifugal shutter mechanism, connected at one end of said rotating shaft of said fan, comprising means for moving the shutter from a closed position, when the fan is disabled, to a normally open position when the fan is enabled, and comprising an hermetic housing assembly for preventing dust accumulating in the vital parts of said mechanism, said housing being made up of a pair of matching molded shells comprising a pair of oppositely radially extending cavities, each cavity including a pair of movable masses equally spaced apart relative to the fan rotational axis and operatively connected to an axially sliding reciprocating actuator via a pair of arms pivotally attached to said hermetic housing, said arms being operatively connected at corresponding ends respectively to the axially sliding actuator located into an axially extending cavity of said hermetic housing coaxially to said fan axis of rotation and positioned adjacent to said central operative vane of said shutter assembly, said axial sliding actuator further comprising an internal operative spring and an operative end located at proximity of the shutter central vane, said actuator being movable between an outwardly position frictionally engaging a convex shaped cam secured to said central vane of said shutter to rotate and shut said shutter central vane and the other vanes by the biasing force of said internal spring and an inwardly position away from said central vane of said shutter for causing the opening of said shutter in response to the rotation of said propeller, said opening and closing controlled by the minimum speed of operation of the said fan.

2. The fan as claimed in claim 1, wherein said plurality of radial airfoil blades comprise radial extending adjustable flexible means mounted at the tips of each blade for adjusting the tip blade clearance with said Venturi of said fan housing, said improved housing including a novel rigid roll formed ring located adjacent to said tip blades.

3. The fan as claimed in claim 2, wherein said adjustable flexible means are made of soft rubber adapted to minimize the clearance between Venturi and tip blades for preventing air from flowing back around the tip blades for increased performance of said fan, enabling it to work efficiently at higher static pressure with reduced air vortices, vibrations and noise.

4. A shutter assembly to close or to open the inlet opening or the outlet opening of a fan, wherein said shutter comprises a frame structure with a plurality of vanes including a central vane pivotally mounted thereon, said vanes extending vertically for preventing dust accumulation, being parallel with one another, pivotal about a vertical

axis defined by aligned projecting pins that extend into corresponding openings on top and bottom framing portions of the shutter frame of said fan, said vanes being pivotally interconnected with crank rods and at least a tie rod and comprising means to be operated by a centrifugal shutter mechanism secured to said fan for rotation positioned in proximity of said shutter central vane, for causing said shutter central operative vane and the other vanes to pivot about their vertical axes, to open the shutter upon fan rotation and to close said shutter when the fan is not operating.

5. The fan as claimed in claim 4, wherein said shutter assembly comprises spring means positioned between said shutter frames and said tie rod for causing the opening of the shutter and for biasing said shutters to a open position with shutter faces aligned to the air flow.

6. The fan as claimed in claim 1, wherein said square frame of said shutter assembly is made of extruded aluminium or plastic elements including longitudinally extending cavities comprising plastic rods on which are pivotally received said vanes of said shutter, said frame assembly being adapted to be mounted selectively either horizontally or vertically across said inlet opening of said fan housing wherein, said frame forming a perimeter labyrinth for protecting from dust the mechanisms of the shutter assembly.

7. The fan as claimed in claim 1, wherein said centrifugal shutter mechanism, in a second embodiment, comprises means for rotatably connecting the shutter central vane of said shutter assembly for pushing or pulling said central operative vane from a first position wherein said vanes closes off the air passage through the inlet opening of the fan housing to a second position wherein air is permitted to flow through the inlet opening of said fan housing.

8. The fan as claimed in claim 1, wherein said centrifugal shutter mechanism comprises an hermetic housing comprising at least a pair of triangle shaped arms comprising a pair of centrifugal masses secured thereto, pivotally mounted into said enclosed housing equally spaced in rapport to the fan axis of rotation, each of said arms being movable connected at corresponding ends with said axial sliding actuator for

transferring radial movements of said radial centrifugal masses, upon fan rotation, to axially movements of said axial actuator. So that said masses and said arms will swing in unison during any axial stroke of the axially sliding actuator.

9. The fan as claimed in claim 1, wherein said vanes of said shutter assembly comprise mating surfaces with labyrinth type means cooperating with the axial sliding actuator with means adapted to provide a positive seal force against said mating surfaces of said vanes, so that leakage is substantially uninhibited, when the shutters are closed to thereby provide an air tight barrier against air movements through the shutter, preventing convection heat losses through the shutter.

10. A centrifugal shutter mechanism associated with a fan shutter, said mechanism comprising means for causing the opening of the shutters and means for closing positively the shutters, wherein said means comprise an axially sliding actuator disposed adjacent to the shutter, said shutter comprising a plurality of self opening vanes comprising a central operative vane pivotally mounted in a rigid frame structure, each vane being pivotal about a vertical longitudinal axis for having an automatic cleaning effect for preventing dust accumulation thereto, for the correct functioning of said shutters.